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ORGANIC GARDENING

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J. I. Rodale—Editor | Sir Albert Howard, C.I.E., M.A., Honorary Editor

With the Editor

THIS month the column will be devoted to describing some of the things we are doing on our experimental farm which consists of 63 acres. We cannot do as much as we would like, due to the shortage of help. There are other factors, due to war conditions, which will also affect the operations in many ways. Yet the results are sufficiently encouraging to make us feel unquestionably that we are on the right track.

Vegetable Garden

The method that we chose to use here was to use our plow to make trenches, about 10 inches deep, and to place about three or four inches of compost at the bottom. This had the effect of loosening up the soil for the seedbed, and placing the compost where it would do the most good. The soil here is a tough clay loam and very compact. It will take a few years to get it into a more crumbly tilth and really fit for use.

True to past experience of those following the organic method, that is, not using chemical fertilizers, and using composts instead, there was practically no evidence of insect ravages. (This is being written July 12th). We used no sprays of any kind except on the cabbages which were badly attacked. In this case we dusted with lime. I feel certain that when the soil becomes properly conditioned in a few years, even this will not be necessary. Our vegetables are doing excellent, and are exciting interesting comment of those who see them.

Mulching

We mulched many of the aisleways with hay cuttings secured free from the parkway system near our farm. It kept most of the weeds down and also maintained a consistent wetness underneath at all times. In the fall we expect to plow this under. By plowing under our mulch each year, there should be a rapid improvement in the crumbly structure of the soil by the addition of this organic matter. We heartily recommend the use of mulches in the vegetable garden. Such things as hay, straw, ground corn cobs, grass clippings, leaves, etc. may be used.

Earthworm And Chemical Experiment

In a small plot we are growing radishes under six differ-

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ent conditions. In the first row we planted them in pure compost. In row two, half earth mixed with half compost. Row three, the same as two with about forty earthworms placed in about four feet of row. Row four, same as two with the addition of a dressing of bonemeal. In Row five, we used only a chemical fertilizer and in row six an extra heavy dressing of the same chemical fertilizer.

Five weeks later the results show up as follows: The row where the earthworms were injected, and where the bone meal was used showed up extra large. The two worst rows were the pure compost and where an excess of chemical fertilizers were used. The row where one-half compost was used is about the same as where the smaller amount of chemicals was used and are fairly large. But where the bone meal and compost, and earthworm and compost was used, the size of radishes are truly enormous, as radishes go. A nearby laboratory is going to make an analysis of all of these radishes.

Planting Whole Potatoes

Just as we were going to put in our potatoes we saw a picture in the New York Times of Lloyd George, former prime minister of England supervising some girls planting potatoes. There were open trenches about five or six inches deep in which they were placing whole potatoes. In other words they did not cut up the potatoes for planting. This was something new to me so I quickly investigated and found that it was quite the custom in most European countries to plant potatoes whole. They picked out the smaller potatoes for planting purposes. I investigated further and found that a big seed company in this country had a special grade of small potato which they recommended be planted whole and which they stated would give an increased yield.

I did not care too much about increased yield but had a feeling that planting potatoes whole was more natural and would result in a crop that would have more nourishment. After all, nature, when she plants, always plants whole seeds. In cutting up potatoes, the raw inside is left open to the elements and is attacked by fungi, yeast, spores, etc. Also, the knife used to cut the potatoes, may spread infection. So we are told to dip the knife in a strong chemical solution after cutting each potato. The effect of this chemical on the potato is ignored, but nevertheless it contributes its share towards producing food of questionable value.

If you will cut open a potatoe you will notice little channels, which seem like a system of veins or arteries. It is possible that this may be the means by which the potato eyes receive their nourishment in the growing process. When you cut open the potato, is it possible that you sever these important channels of communication? Stored within the jacket of the tuber, nature has placed everything the "eye" needs to start life, even moisture. A potato may be 90% water. When you cut it, the moisture immediately starts a drying out process. Plant the whole potato and the water within is conserved for a maximum period. Is it possible that the jacket is a protection against harmful organisms in the soil?

This is all theorizing. Now let us see what happened to the 400 pounds of whole potatoes which we planted. In the first place the growth of the plants was remarkable. Heavy, fine leaves and stalks with practically no potato bug infestation. Of course, we must wait for the harvest to get the final results, but from present indications we should have wonderful potatoes.

Compost Heaps

Will some of our readers perform the following experiment? Make two compost heaps. Make one the regular way. In the second one, place a good quantity of earthworms. See if the one with the earthworms will be broken down quicker and much finer.

Our Green Matter Tract

There are some persons who believe that animal manures or any other kind of animal matter should never be used for fertilizer. It is their opinion that plant disease and insect infestations are due to the use of such material. Sir Albert Howard, on the other hand, states that without using animal manures, there will eventually be trouble. We have taken about a half acre and will use only plant matter, lime, rock phosphate, etc. It may take a long time to check results but we feel it is our duty to demonstrate one way or another whether such a method will be successful.

J. I. Rodale

A New Policy For Agriculture

By Sir Albert Howard, C.I.E.

THE VETERINARY JOURNAL (London, England)

THE specialist in the diseases of livestock who reads the title of this article will wonder why the troubles which afflict crops have intruded into a journal specializing in veterinary science and largely devoted to the maladies which afflict our domesticated animals. The reason is that Nature is one and indivisible and that many of the diseases of livestock have their origin in the soil and are closely connected with the lack of quality in the crops on which these animals feed. If this point of view can be established it follows that the basis of the veterinary practice of tomorrow must be broadened to include the whole range of husbandry, so that our livestock can be studied in relation to their environment. This means that the future veterinarian will have to take a much wider sweep of the subject and finally become a student of animal husbandry in the widest sense. Following our English tradition, the future veterinary surgeon will, of course, retain his old title, but the scope of his work will expand and his usefulness and standing in the farming world will improve out of all knowledge. To accomplish all this, far-reaching changes in veterinary teaching will be necessary which will also involve a drastic reorganization of the research work now in progress.

What evidence exists to justify an inquest on present-day teaching and research in veterinary science? What is amiss with the principles underlying our existing policy? The purpose of this article is to answer these questions, to suggest that the whole subject be reconsidered and that a new policy, based on preventing disease altogether, should take the place of current practices.

In presenting the evidence in this matter I can best begin by briefly recounting my own experience of disease in plants and livestock, which has covered a period of over forty years spent in agricultural research in many parts of the world.

I took up research in agriculture as a mycologist in the West Indies in 1889, where I specialized in the diseases of sugar-cane and cacao and became interested in tropical agriculture. Almost at once I discerned a fundamental weakness in the research organization: the mycologist had no land on which he could take his own advice about remedies before asking planters to adopt them.

My next post was botanist at Wye College in Kent, where I was in charge of the experiments on hops and had ample opportunities for studying the insect and fungous diseases of this interesting crop. But again I had no land on which I could try out certain ideas that were fermenting in my mind about the prevention of hop diseases.

In 1905 I was appointed Imperial Botanist to the Government of India. At the Pusa Agricultural Research Institute I had for the first time all the essentials for work—interesting problems, money, freedom, and, last but not least, 75 acres of land on which I could grow crops in my own way and study their reaction to insect and fungous pests and other things. My real training in agricultural research then began —six years after leaving the University and obtaining all the paper qualifications and academic experience then needed by an investigator.

At the beginning of this second phase of my training I resolved to break new ground and try out an idea (which first occured to me in the West Indies), namely, to observe what happened when insect

and fungous diseases were left alone and allowed to develop unchecked, and where indirect methods only, such as improved cultivation and more efficient varieties, were employed to prevent attack. This point of view derived considerable impetus from a preliminary study of Indian agriculture. The crops grown by the cultivators in the neighborhood of Pusa were remarkably free from pests of all kinds; such things as insecticides and fungicides found no place in this ancient system of agriculture. I decided that I could not do better than watch the operations of these peasants, and acquire their traditional knowledge as rapidly as possible. For the time being, therefore, I regarded them as my professors of agriculture. Another group of instructors were obviously the insects and fungi themselves. The methods of the cultivators if followed would result in crops practically free from disease; the insects and fungi would be useful for pointing out unsuitable varieties and methods of farming inappropriate to the locality.

In order to give my crops every chance of being attacked by parasites, nothing was done in the way of prevention; no insecticides and fungicides were used; no diseased material was ever destroyed. As my understanding of Indian agriculture progressed, and as my practice improved, a marked diminution of disease occurred. At the end of five years' tuition under my new professors—the peasants and the pests—the attack of insects and fungi on all crops, whose root systems were suitable to the local soil conditions, became negligible. By 1910 I had learnt how to grow healthy crops, practically free from disease, without the slightest help from mycologists, entomologists, bacteriologists, agricultural chemists, statisticians, clearing-houses of information, artificial manures, spraying machines, insecticides, fungicides, germicides, and all the other expensive paraphernalia of the modern Experiment Station.

I then posed to myself the principles which appeared to underlie the diseases of plants:

1. Insects and fungi are not the real cause of plant diseases but only attack unsuitable varieties or crops imperfectly grown. Their true role is that of censors for pointing out the crops that are improperly nourished and so keeping our agriculture up to the mark. In other words, the pests must be looked upon as Nature's professors of agriculture: as an integral portion of any rational system of farming.

2. The policy of protecting crops from pests by means of sprays, powders, and so forth is unscientific and unsound as, even when successful, such procedure merely preserves the unfit and obscures the real problem—how to grow healthy crops.

3. The burning of diseased plants seems to be the unnecessary destruction of organic matter as no such provision as this exists in Nature, in which insects and fungi after all live and work.

This preliminary exploration of the ground suggested that the birthright of every crop is health, and that the correct method of dealing with disease at an Experiment Station is not to destroy the parasite, but to make use of it for tuning up agricultural practice.

Steps were then taken to apply these principles to oxen, the power unit in Indian agriculture. For this purpose it was necessary to have the work cattle under my own charge, to design their accommodation, and to arrange for their feeding, hygiene, and management. At first this was refused, but after persistent importunity, backed by the powerful support of the Member of the Viceroy's Council in charge of agriculture (the late Sir Robert Carlyle, K.C.S.I.), I was allowed to have charge of six pairs of oxen. I had little to learn in this matter, as I belong to an old agricultural family and was brought up on a farm which had made for itself a local reputation in the management of cattle. My work animals were most carefully selected and everything was done to provide them with suitable housing and with fresh green fodder, silage, and grain, all produced from fertile land. I was naturally intensely interested in watching the reaction of these well-chosen and well-fed oxen to diseases like rinderpest, septicaemia, and foot-and-mouth disease which frequently devastated the countryside. None of my animals was segregated; none was inoculated; they frequently came in contact with diseased stock. As my small farmyard at Pusa was only separated by a low hedge from one of the large cattle-sheds on the Pusa estate, in which outbreaks of foot-and-mouth disease often occurred. I have several times seen my oxen rubbing noses with foot-and-mouth cases. Nothing hap-

pened. The healthy well-fed animals reacted to this disease exactly as suitable varieties of crops, when properly grown, did to insect and fungous pests —no infection took place.

As the factors of time and place are important when testing any agricultural innovation, it now became necessary to try out the three principles referred to above over a reasonable long period and in new localities. This was done during the next twenty-one years at three centres: Pusa (1910-24), Quetta (summers of 1910 to 1918), and Indore (1924-31).

The results obtained at these three centres, which covered a total period of twenty-one years, more than confirmed the preliminary observations described above. In one direction—virus disease—new ground was broken. This was observed on tobacco. When care was devoted to the details of growing the seed, to the raising of the seedlings and to transplanting, as well as the humus content of the soil, this disease soon disappeared and for nearly fifteen years not a single diseased plant was observed. Nothing was done in the way of prevention beyond good farming.

One significant factor was common to all these results—namely, the role of well-made farmyard manure for maintaining soil fertility, which in turn appeared to be the basis of health.

Humus and Disease Resistance

Even on the experiment stations in India the supply of farmyard manure was always insufficient. The problem was how to increase its volume and to improve its quality. The solution was suggested by the age-long practices of China. It involved the study of how best to convert the animal and vegetable wastes into humus, so that every holding in India could become self-supporting as regards manure. But such a problem did not fall within my sphere of work—the improvement of crops. It obviously necessitated a great deal of chemical work under my personal control. The organization of research at Pusa, however, had gradually become more rigid; the old latitude which existed in the early days became a memory. That essential freedom, without which no progress is possible, had been slowly destroyed by the growth of research organization based on the practical problems which needed investigation. The instrument became more important than its purpose. Such organizations, of course, can only achieve their own destruction. This was the reason why I had to leave Pusa and spend some precious years in collecting the funds to found a new centre where I should be free to follow the gleam unhampered and undisturbed. All this took six years—1918 to 1924—before the Indore Institute could be founded. In due course a simple method, known as the Indore Process of composting vegetable and animal wastes, was devised, tested and tried out on the 300 acres of land at the disposal of the Institute of Plant Industry, Indore. In a few years production more than doubled, the crops were to all intents and purposes immune to disease. In 1931 the results were published by the Oxford University Press in book form under the title—*The Waste Products of Agriculture: Their Utilization as Humus.* In this work I was ably assisted by one of my Indian staff—Mr. Y. D. Wad—the junior author of the final report.

Since 1931 steps have been taken to get the Indore Process tried out all over the world, at first by the great plantation industries—coffee, tea, sugar, sisal, maize, cotton, tobacco and rubber—and later, in farming and gardening. The results have confirmed and indeed have extended those obtained at Indore.

In 1939 an important development occurred. On March 23 of that year the *Medical Testament* of the County Palatine of Chester Local Medical and Panel Committees was unanimously adopted at a public meeting held at Crewe. In this document the independence of the public health system of tomorrow on the fresh produce of a fertile soil was foreshadowed. Its adoption was followed by: (1) The County Garden Competition (which has done much to make Cheshire compost minded), and (2) the publication of the *News Letter on Compost,* the purpose of which is to record the growing volume of evidence that soil fertility is the basis of public health.

It soon became evident that the time had come to set out the whole humus case in such a manner that a new foundation for agricultural research could be established, which could replace the organization based on the fragments—the separate sciences—of a great biological complex. This took the form of *An Agricultural Testament,* which was published by the Oxford University

Press in June, 1940, and reprinted two years later in June, 1942.

The various publications have led to important developments overseas, notably in South Africa, New Zealand and the United States of America, in all of which new ground has been constantly broken. The progress made can be followed by consulting the following three periodicals:

(1) *The Farmer's Weekly* of South Africa (P.O. Box 387, Bloemfontein, S.A.).

(2) *The Compost Club Magazine* of New Zealand (P.O. Box 1303, Auckland, N. Z.).

(3) *Organic Gardening* (The Rodale Press, Emmaus, Pa., U.S.A.).

The Mycorrhizal Association and Disease

Why is humus the basis of disease resistance and of fertility in the crop and also in livestock? The circulation of protein in Nature and the mycorrhizal association provide a clue.

Let us first consider the significance of the circulation of protein. The first stage in this process is the synthesis of humus from vegetable and animal wastes through the agency of fungi and bacteria. Humus results from the amalgamation of the undecomposed portions of the vegetable and animal wastes of a properly assembled and properly managed compost heap, and the dead bodies of the fungi and bacteria which ferment these wastes. Such humus can be looked upon as the first segment of the wheel of life. In the soil this humus undergoes two very different series of changes: (1) A portion is mineralized by the soil organisms with the formation of the salts needed for the work of the green leaf; (2) some of the remainder nourishes certain soil fungi which invade the active roots of the crop and live therein in partnership with the plant. Eventually the fungous threads of this mycorrhizal association are digested by the plant, by which means proteins pass from the soil to the green cells of the leaf. The first step in the circulation of protein in Nature is thus accomplished.

The next step in this circulation by means of animal and human digestion is so well understood that it needs no argument. When the waste products of the animal and of the plant come together again this circulation of protein is resumed. That is what takes place in Nature—in the forest, in the prairie and in the ocean. If we copy it in our agriculture, two important consequences are realized: (1) the plant and the animal retain the fertility principle; (2) both plant and animal are able to resist the parasite. If, however, we interpose a substitution phase for the essential protein by the use of artificial manures, the power of reproduction is lost and the plant and the animal are compelled to retreat before the parasite.

One of the many examples from crop-production which can be quoted to establish this thesis is the cultivation of the vine. In the Orient this crop is always manured with the farmyard manure; artificials are unknown. The consequence is that the variety does not run out: It is to all intents and purposes eternal, because each generation is grown by methods laid down by Nature. Moreover, there is practically no disease. In the West, where the crop is raised mostly on artificial manures, the variety soon runs out and insect and fungous pests have to be kept at bay by means of poison sprays.

In livestock similar results are obtained. That the nutrition of our animals is leading to difficulties in reproduction is proved by the growing incidence of the infection with the breeding animal. The lowered resistance to disease is indicated by the constant reappearance of a virus trouble—foot-and-mouth disease, the occurence of which is a sure sign that something is wrong with the circulation of protein.

How can these views of disease and its prevention be put to a critical test? By practical experience.

In the case of crops this is now being done everywhere and the results obtained support the thesis put forward in this article. I will quote one example. A few years ago Mr. A. R. Wills, of the Tadburn Nursery, at Romney, Hampshire, found that the use of chemicals in his tomato houses led to wilt disease. Three houses—three acres in extent—became badly infected. On my advice he composted the diseased haulms of these three acres, applied the compost to the same houses and grew a new tomato crop. This was free from disease. He then took up the Indore Process and gave up the use of artificials. His nursery has never looked back. It now enjoys a high reputation for quality and there is a great demand for the produce.

In the case of foot-and-mouth disease a similar crucial experiment is needed. A cattle farm should be first put in order by means of freshly prepared humus and a breed which suits the locality should then be got into good fettle by means of produce raised on the farm. A few mild foot-and-mouth cases should then be allowed to run with the herd. Two things are likely to happen. The affected animals will soon recover and the herd will either escape infection altogether, or if a few cases develop, they will rapidly cure themselves. Similar results will be obtained in such troubles as mastitis, contagious abortion, Johne's disease, tuberculosis and so forth.

When these results are obtained the veterinarian of the future will be in a position to make use of the diseases of livestock to test farming practice. If the introduction of a diseased animal on a farm leads to new cases, then all is well with the methods employed. If infection does take place, then a case for the complete overhaul of the methods of agriculture is called for.

It follows from the above that the current proposals for the control of animal diseases by orthodox methods, such as the direct assault on the parasite, or its avoidance, by vaccines and sera, are bound to fail, because they are based on the wrong principles. All these troubles are messages from Mother Earth that things are not well. We must, therefore, give the right answer to these messengers of Nature; the underlying causes of the dispatch of these missives must be removed. This can only be done by the methods above indicated—the restoration and maintenance of soil fertility, so that the food of the animal is properly constituted. This must be followed by good management.

So much for future policy. What is to be done while our inheritance—the soil of the island in which we are living—is being restored to us? How are we to liquidate the vested interests—professional, administrative and commercial—which are firmly established along our path?

As far as the veterinary practice is concerned, a dual policy must be pursued—the present methods will have to be continued, but with more and more modifications in the direction of prevention. Eventually preventitive methods will replace the idea of direct control.

The elimination of the various vested interests can, in my judgment, be achieved only in one way—by arranging matters so that Mother Earth herself gives the verdict in the suits—"humus versus artificials" and "humus versus a combination of the two." The procedure that must at all costs be avoided is to attempt to settle these problems by discussion and argument. This will only lead to infructuous disputations between the lawyers on either side. But if the question is properly posed to Mother Earth, her verdict will be so clear and definite that nothing more need be said.

How can this matter be put to Mother Earth in such a manner that both sides can get a square deal? In a very simple way. Arrangements must be made for two farms to be run side by side, one based on the law of return, the other on the use of artificial manures. In both farms the crops and the breeds must be raised from seed or animals fed on the local procedure. In this way the cumulative effect of the soil on the crop—plant and animal—will be recorded.

Such a test is already in progress at New Bells Farm, Haughley, near Stowmarket, in Suffolk. An account of Lady Eve Balfour's scheme will shortly appear in book form. I sincerely commend it.

Soil Fertility, Food Production and Health

By T. H. Sanderson-Wells, M.B.E., M.D., F.R.C.S.

Reprinted from the COMPOST CLUB MAGAZINE
(Auckland, New Zealand)

This article which was specially sent to this magazine by Dr. Sanderson-Wells originally appeared in the "Dorset County Chronicle".

Dr. Sanderson-Wells, who formerly lived at Weymouth, and now resides in London, is a son-in-law of the late Dr. J. Macpherson Lawrie, of Weymouth, the famous physician.

He holds the degrees M.D., B.Sc. (Lond.) and F.R.C.S.E., is an M.B.E., Medical Officer with the rank of captain in the Middlesex Home Guard, and M.O. to the Westminster and St. James's Palace Red Cross V.A.D. detachment.

Dr. Sanderson-Wells is also chairman of the Food Education Society, of which Lord Horder recently became president in succession to the late Sybil Viscountess Rhondda. In 1938 *his book, "Sun Diet", was published by the Middlesex Hospital Press.*

Through his interest the Sanderson-Wells prize is awarded to nurses at the Middlesex Hospital for knowledge of nutrition, and the London University has also established prizes in his name for intermediate students on "The physiology of food", and for final students and newly-qualified practitioners on "The diseases arising from food" or 'The pathology of food".

THE future of the world depends on the health and stamina of British people. Health and stamina are supported on quality foods which can be grown only on fertile soil. Soil fertility is therefore an urgent national problem. The land where depleted fertility must be restored.

In fertile soils the humus content is high, permeability is satisfactory, there is no crusting, neither do winds blow the earth away as dust.

During the present century vast virgin tracts have become semi-desert from soil erosion, the result of taking from the land without equivalent return.

"Out of the soil back to the soil" is the eternal cycle of life. From disobedience to this law

much agricultural land is in poor heart.

Our present water-carriage system has undoubtedly starved the land of its rights. Destruction of town wastes has contributed. Town-made taxation has frustrated the farmer's desire to feed his land adequately.

Sir Albert Howard states:

(1) Ordinary farm manure heaps are biologically unbalanced and chemically unstable.

(2) Organisms are trying to synthesize humus with far too much urine and dung and far too little cellulose, lignum and air, and in consequence live a life of constant frustration.

(3) If these heaps are mixed with three volumes of ordinary town wastes the fungi and micro-organisms are supplied with all the cellulose and lignum they require; aeration is provided; the volume is multiplied at least three times and its efficiency is increased.

Experiments on plants have proved that this humus compost revives nature's symbiosis between soil, root, and soil-dwellers.

Howard says "In the presence of humus, living threads of fungus tissue pass into the root and are digested there."

Sir Robert McCarrison's work among Indian tribes has also proved that such vegetation fed to animals, and in animal and vegetable foodstuffs to men, transfers this tissue resistance and develops high protection against disease combined with increased fertility and vigorous health.

This intimate connection is illustrated by the following:

In 1907 Howard procured a tract of land in India and refertilized it. In 1910, a herd of cattle was brought to this farm and kept there until 1931. Howard says: "For 21 years I studied the reaction of animals fed on fertile soil to rinderpest, foot and mouth disease, septicaemia and so forth. These diseases frequently devastated the countryside. None of my animals was segregated. None was inoculated. I watched them rubbing noses with foot-and-mouth cases. During the 21 years no infectious disease occurred".

Pest-covered plants transferred to Indore-Process-fertility-soil clean themselves in a few months, and acquire health and vigorous growth.

Today the statement can be made that health depends on a fertile soil which can be produced by proper use of animal and vegetable wastes.

This discovery opens untold possibilities. Social services could be vastly reduced, and town refuse put to good purpose.

On November 8, 1939, Dr. Lionel Picton and the 600 panel practitioners of the County Palatine of Cheshire issued this medical testament:

"Our daily work takes us repeatedly to the same point that illness results from a lifetime of wrong nutrition. The wrong nutrition begins before life begins. The reproach of the bad teeth of English children, and the varied host of maladies which spring from bad teeth, is an old story. That its removal is possible is shown by Tristan da Cunha.

"Rickets is a heavy contributor to a C3 population. The maternal mortality committee found there is much less in Holland where butter, milk and cheese are plentiful and women by their healthy skeletal development are protected against the risks faced by women in the industrial areas of Britain."

After citing nutritional anaemia and constipation the testament concludes:

"Nutrition and the quality of food are the paramount factors in fitness. No health campaign can succeed unless the materials of which bodies are built are sound. At present they are not. This is our medical testament given to all whom it may concern and whom it does not concern."

These 600 panel practitioners did not stop with publication of their testament. Practical steps were taken. Advice as to soil refertilization and food production was issued to allotment holders and patients with gardens. Competitions were inaugurated. Prizes to the amount of £70 were offered annually. Enthusiasm was aroused by visiting doctors. The campaign extended to home grinding of corn and home bread making.

The Panel Committee issued conditions. The first two were:

(1) The garden must be manured with compost.

(2) No artificials must be used.

The following statement was issued:

"The soil is not a dead mechanical device for carrying chemicals which will act as plant food. It is a living substance which must be treated as such if we are to retain it and grow healthy plants and good food for ourselves.

"Our object is better food, better grown, better chosen, fresher.

"Our bodies are our garden to which our wills are gardeners."

The better health, increased alertness and vigour; better teeth, reduction in sprains,

fractures, infectious disease and in infant and maternal mortality, noted by these patriotic practitioners need not be limited to Cheshire if other counties followed their example.

Farmers, market-gardeners and landowners can produce from waste residues a compost manure, rich in humus, capable of restoring land to good heart, of increasing the quantity, quality and value of crops, of eliminating costs for sprays and fertilizers, and of restoring the bodies of their fellow countrymen, women and children to vigorous health.

Sir Albert Howard's Indore Process is as follows:

(1) Collection and mixing of all plant residues, weeds, leaves, old straw and hay, bracken, reeds, seaweed, hedge trimmings, etc.

(2) Animal manure, from horses, cattle, sheep, pigs, rabbits or poultry. This is essential.

(3) Earth, lime, as ground limestone or chalk, wood-ash, or preferably a mixture of all three as neutralizing agents.

(4) Water. Rain will supply this. In wet weather a sloping roof of rough boughs or poles is necessary to support a covering. The heap must not be too wet, the consistency of a squeezed sponge being aimed at.

(5) Paper, worn-out clothing, leather and sacking, can also be added after previous soaking in water.

Green material should be withered and hard woody material cut into short lengths and crushed where possible by, for example, wheel traffic.

Resistant lignins or leather can be transferred from heap to heap if the initial attack is insufficient to break them down.

During the early stages of decomposition air is required in large quantities by the micro-organisms in the heap. For this purpose the heap must be made as loose as possible. After the fungus stage is over and the material has crumbled and darkened fermentation becomes anaerobic, i.e., no air is required from outside. The organisms obtain their oxygen from the decomposing material itself.

Square or rectangular heaps should be built, and on the sandwich principle on earth, *not concrete*. The bottom should be made similar to a haystack of hedge trimmings, bush fruit prunings, or other material to act as an open base for aeration.

A horizontal layer of about 6 inches of mixed organic wastes is followed by a thin layer of about 2 inches of animal manure, covered by a good sprinkling of earth containing, where these are available, wood-ashes and lime, preferably chalk or ground limestone. The layers of mixed organic wastes, manure and earth with wood-ash and lime are repeated to a height of from 4 to 5 feet.

The final layer of manure should be twice the previous thickness and the final sprinkling of earth should completely cover the manure.

In districts of heavy rainfall it is advisable to arrange for the finishing layers to form a double slope. In most districts of England a temporary covering is essential to protect the heap against excessive rain. The covering should be raised to allow air to circulate.

The minimum size of the compost heap should be 5 ft. x 5 ft. x 4 ft. high. With any size smaller the ratio of cooling surface to volume is too great. When making small heaps build the second against the first and so on. The heat is then conserved. Larger heaps width to 15 ft. maximum length in 5 ft. sections. Height from 4 to 5 feet.

The heap will sink to about 2 ft. 6 in. to 3 ft. before turning. Space must be allowed for turning the heap. Two turns are required to complete the process.

To regulate the supply of air, make the heap as loose as possible. Don't step on it. Punch out vertical holes 4 to 6 inches in diameter with a rod or crow-bar. These chimneys should be 3 ft. apart and about 2 ft. 6 in. from the sides of the heap.

The heap is left for three weeks before the first turn is made. An intense fermentation sets in. The temperature rises to about 150° F. Weeds and seeds are destroyed. The inside turns white with fungus growth. After three weeks the heap is turned from one end to a new site, care being taken to bring the outside to the inside of the remade heap. Funnels are rebored. For the first turning cut 1 ft. vertical slices after the manner of cutting bread, but with a fork.

About two months after the heap was originally made, make the second turn. The outside is brought to the inside and, where necessary, protected from rain. No funnels are required as the fermentation has now become anaerobic. A spade should be used, the slices being about 6 in. wide.

Three months after the process began, the material is ready for application to the land. It consists of a finely di-

vided product of which about 80 per cent will pass through a sieve of six meshes to the linear inch.

The ideal site faces south with a break from the north. Where heaps are only five to six feet square, or smaller, protection should be given on three sides by means of walls or hedges. Mutual protection by old and new heaps wherever possible.

Protection against excessive rain has already been mentioned. The opposite posibility—dryness—must be watched for, and if the rain is insufficient, water must be added. This must not be sluiced on to the heap with a bucket but sprayed either by a hose with a nozzle or from a can with a rose. At the time of turning, water from a bucket may be sprinkled on to the material cut from the heap before it is remade into the new heap.

The consistency of a squeezed sponge is the guide to which the maker should work. It is impossible to lay down hard and fast rules concerning either protection of the heap from rain or addition of water in the absence of rain. The heap has life, and must be looked after like all living things.

Earthworms and Chickens

By J. I. Rodale

LAST month I described some of the things we are doing with earthworms and chickens. Since then we have completed one pit under one of our flock's roosts in the hen-house. Here is how we went about it. We encased the sides of the roosts with a wooden box effect, about three feet high. We nailed chicken screening on top of this so that the chickens cannot get into it. The roosts are then placed about 5 inches above this screening. This screening is mounted on a frame which is removable, in case you want to work on the material inside the case. There is a cement floor that covers the entire hen-house, with an air space between it and the ground.

Now, we found a place on the farm where there was a heap of corn stalks and corn cobs. Underneath these heaps there was a natural breeding ground for earthworms and there were thousands of them. If you are figuring on following this method you will either have to purchase earthworms from one of the breeders, or you had better make piles of stalks or hay or corn cobs. etc. In a few months you will begin to see the earthworms multiplying.

We dug out the worms along with the earth in which they lived and placed them under the roosts, earth and all, to a height of about a foot. We dug a little each day. The purpose of this particular experiment in this chicken house was merely to find a method of doing away with the chore of cleaning out under the chicken roosts.

Ordinarily the poultry man places boards about a foot under the roosts. Every week or perhaps twice a week he will laboriously scrape the droppings from these boards, otherwise the odor in the chicken house would become unbearable. A new method was worked out some years ago in which a dropping pit replaces the boards. The pit is about the same as the one we described above. As the droppings accumulate, the farmer sprinkles super-phosphate in the pit. This serves two purposes. The super-phosphate destroys the odor and since super-phosphate is one of the most popular chemical fertilizers, this angle of the fertility problem is automatically taken care of.

Now, we do not advocate the use of chemical fertilizers, so the use of super-phosphate or any other strong chemical deodorant, is out as far as we are concerned. With the use of earthworms, however, the whole problem is beautifully solved. The earthworms consume the droppings and then there should not be any odors. Now how did we actually fare? Every day we dug a few earthworms and placed them with their earth in the pit. But still there was an odor. We felt pretty bad about it. One day we got good and mad and spent an extra amount of time digging for the crawlers. After that day the odor naturally disappeared and for weeks the

earthworms have been disposing of the droppings.

These droppings go through the digestive tract of the worms, are mixed with secretions, and come out as castings which comprise a wonderful topsoil. It no longer has the property of chicken manure of "burning." It is now a mellow, finished organic substance.

Every day we sprinkled water into the pit, as earthworms like it moist. Soon, however, we noticed that the litter around the outside bottom of the pit became moist. Evidently, the water accumulated at the bottom and worked out at the bottom of the sides. This was not a satisfactory condition. It would have been best if the pit was made lower than the regular floor level, with a concrete floor and drainage holes covered by screening which would not allow the worms to escape. The sides should be made of brick. This is how we are doing it with another flock, the room for which is under construction. All of these chickens can roam around outside on a large fenced-in grass tract.

We should have been more careful when we transferred the earthworms into the pit. We should have included some peat, humus or other absorbent material, even small pieces of burlap (which earthworms eat, by the way). This may have prevented the soggy condition of earth from occurring.

In about two weeks after the odor disappeared it returned again but very mild this time. We had sixteen boxes of earthworms in the cellar, which we were breeding to feed our chickens. Instead, we took fourteen boxes and emptied them into the chicken pit. The odor almost immediately disappeared. These boxes are full of humus, so I am sure the soggy condition will not return.

We are making an important change in the next pit, however, so that the chickens will get some of these earthworms, anyway. We are making big slits on each side of the four sides of the pit, at the floor line so that some of the earthworms can get out there. We will then place earth on the floor of the chicken house only around the pit, for about two feet on each side to a height of about eight or ten inches. There will be a wooden form at the end of the earth line and where the regular straw litter begins so as to have a line of demarcation.

The chickens will be allowed to scratch in this earth outside of the pit and catch the occasional worm. Whether this system will work in the winter time when things freeze up remains to be seen. There may be other "hitches" and developments and we will keep our readers informed as time goes on.

One of our little chicks about three weeks old became paralyzed a week ago. It sat in a corner and would not move. From experience we know that in such a case the chick rarely survives. Remembering what Mr. Koenig of Minkdale Farms, Newton, Connecticut had done with three lame chickens, we went to work and did the same thing. He fed these chickens earthworms and in a few weeks they made a complete recovery. We did the same. We isolated the chick and fed it twenty-five earthworms a day for four days. At the end of the fourth day it was running around as chipper as ever and with as bright an eye as you ever saw in a chick. We are betting on earthworms, and how!

Club Root and its Control

By Sir Albert Howard

ONE of the commonest diseases of the cabbage and turnip crop is club root which is attributed to one of the slime fungi. The conventional remedy is to apply a dressing of lime to remove the sour condition of the soil which is said to favor the incidence of this pest.

In March last a correspondent—Mr. D. Eastmond of Kingston, Gilmerton Road, Edinburgh, 9—reported that he had almost eradicated club root by the application of humus. I had not then come across any similar case, but on

reading the recent reprint of Elliot's *The Clifton Park System of Farming* (Faber & Faber, 1943) I found some interesting confirmatory information on this subject. As is well known, the late Mr. Elliot's system of grass land management was based on deep-rooting plants like chicory, burnet, kidney vetch and cocksfoot, which broke up the soil pans underneath the surface soil and at the same time restored soil aeration, as well as the content of humus. At Clifton Park, fields which had been under grass containing the above deep-rooted plants and were then ploughed up for turnips yielded crops free from club root without any dressing of lime, although the neighboring farms were riddled with this disease.

Mr. Elliot sums up his experience of club root in the following words and also refers to his experience of coffee diseases in Mysore:

"Good physical conditions, then, whether in the case of a soil well permeated with vegetable matter, or in the case of a sandy loam of equally good conditions, being favorable to the health of the plant, seem equally unfavorable to turnip disease. Large sums are spent in heavily liming land for no other reason than because it is a preventitive of turnip disease. But from my long experience on this estate I am strongly of opinion that all the money spent on remedies or preventives might be saved were the land well stored with turf in various stages of decay. My experience in the case of my Indian coffee plantations strongly confirms this view.

"As long as our soils were stored with the vegetable matter of the primeval forest all diseases to which our coffee was liable only existed to a trivial extent, but as the land became exhausted of its vegetable matter, and our soils thus lost physical condition, such diseases much increased. They can, however, be again reduced if the soil is dressed with applications of top soil taken from forest lands. I am now applying the same treatment to my coffee as I am to the Clifton-on-Bowmont farm—i.e. applications of vegetable matter in various stages of decay, through the medium of jungle top soil in the former case and turf in the latter.

"*Advantages of Deep-Rooted Plants.* The results which have been attained from filling the land with deeply rooted turf are as follows: the crops ripen earlier; the land is warmer; it dries much more quickly. Carting on the land does little harm to it, or to the young grasses and plants. Superfluous moisture passes downwards so rapidly that all wash is avoided. The land can be much more easily and deeply ploughed and worked. The deep-rooters can penetrate the hardest pans. Weeds are absolutely extinguished, and at Clifton-On-Bowmont, for the last eighteen years there have been none worth removing. No risk of clover failure, though there had been much failure on adjacent farms. No turnip disease, though there had been much in certain seasons, with the exception of one small portion of the land, and that only occurred once.

"No manure required except some artificials with turnips when first turf is ploughed. As far as we can see at present, no manure is needed when the second turf is ploughed, as the land is then fully charged with deeply-rooted decaying turf. Products of all crops certain, either in very dry or very wet seasons. More stock can be kept at the same cost. They can be kept in much better health owing to the properties of some of the plants used. Less capital is required for working the farm. As the deep roots decay the land is permeated to its greatest depth (chicory will go down from three feet to four feet in fifteen months, and 1 ft. 6 ins. in three months) with vegetable matter. The land can thus be deeply aerated, and more moisture carried into it to the advantage of the land in droughts.

"In dry weather the land cools sooner, and more dew will be precipitated. By the steady increase of humus, and the deepening and tilling of the soil by roots, the fertility of the land can be continuously improved without additional expense. Manurial matter which has sunk low in the soil can be retrieved by the deep-rooters. Land well supplied with humus retains much heat which would otherwise be lost. It also retains 20 per cent more moisture than a mineralized soil. It is important to note too that the air passing over a humus-fed soil, would be cooler and moister than air passing over a mineralized soil. The dewfall therefore would be greater and when the land throughout the country becomes generally humus-fed, the rainfall would be more advantageously distributed. and fall over a greater number of days in small showers instead of heavy falls of rain, as in the case when land is clothed with forest.

"Tough, clayey, and unworkable soils, which readily run together, can be ameliorat-

ed by the system, and completely altered in character. Finally, roots, by virtue of the acids in them, can utilize portions of the mineral matters locked up in stones. I have now given twenty-five distinct advantages which will certainly be obtained from the adoption of my system. I may add that owing to the want of the means of duly keeping up a good supply of humus in the land the soils of Great Britain are, to a very large extent, in deplorably bad physical condition, and this has been much worsened by liming and the injudicious use of artificial manures."

These results suggest that club root should in future be looked upon not as a pest to be destroyed, but as a message from Mother Earth, that the soil is in need of a good dressing of freshly prepared humus. The crops will then look after themselves. The money and labor now devoted to dressings of lime could be much more effectively spent on the reform of the evil-smelling manure heap and its conversion into a humus factory. Two birds would be killed with one stone. The disease would be controlled: soil fertility would be restored.

Hints for the Victory Gardener

SALSIFY

Vegetable-Oyster

This is the eighth of a series of articles by this author dealing with the cultivation of ordinary vegetables.

By Roger W. Smith

NO root crop is dearer to the heart of the Victory gardener than the salsify (oyster plant). Other root crops are produced commercially. It remains for the salsify to be essentially a home-garden vegetable.

You will find it an interesting plant and one very easy to grow.

Because of the many hair roots which it forms, the salsify was named by the Romans "Sassefrica" or goat's whiskers. It is a member of the chicory family and is closely related to both the common dandelion and the arum lily.

Salsify is much in demand in soups and the like because it produces a flavor like that of oysters. Boiled salsify may be put through a ricer and the resulting material made into small cakes. When fried in deep fat these cakes very closely resemble fried oysters.

All of which may be of great interest to the Victory gardener's wife in these days of food rationing; your interest is in the successful growing of the plant.

Salsify does not form its full sized roots rapidly as does the radish. It demands plenty of natural plant food. Because it has never, since the time it was found growing in the wild, been greatly changed, it grows practically without serious injury from insect or fungi parasites.

Just as early in the Spring as your garden can be worked, you should be out preparing a place for your salsify. The whole area in which the plant is to grow should of course be spaded if this chore was not done during the preceding fall.

If the soil in your garden is very heavy, that is, contains a large percentage of clay; or if the soil is very shallow above a hardpan, you will find it most advisable to break up the subsoil, so that the penetrating roots of the salsify will have a good place in which to form.

Unless you are fortunate enough to have in your garden sixteen inches of good rich loam, you will find it advisable to double-dig that part set aside for the planting of salsify.

Double-digging is very simple. Using a guide line you dig a trench about eight inches deep and the width of the

spade. The topsoil from this trench is set aside.

A layer of clean, washed sand about two inches deep if that much is available, should be placed in the bottom of the trench.

You then proceed to dig in the sand and turn over the material at the bottom of the trench. If this is too difficult, this material should at least be broken up.

The topsoil which was removed from the trench should then be mixed with an equal amount of mature compost humus and returned to the trench.

A second trench similar to the first should then be dug and filled, and so on according to the number of rows of salsify you intend to plant.

After this has been done you will find that because you have added much more material to the trenches than was removed from them, they stand out as high ridges. These ridges should be leveled with a rake.

Avoid the use of fresh stable manure when growing salsify. As you know, this material belongs upon the compost heap. Its direct application to the roots of the salsify plants has been found to greatly increase the formation of prongs.

Of course, as with all other root crops, you will see to it that the location you select for your salsify is entirely unshaded and quite free from the food-seeking roots of maples and other trees.

You will find it advisable to plant the seeds fairly close together and about an inch deep. This is because the salsify seeds remain viable for only one year. Even at this, much of the seed fails to grow. So it is best to sow enough seed to produce a good stand even though you have to thin the seedlings later.

When the seedlings are up and thinned they should stand about three inches apart in the row.

As with other root crops, salsify demands an abundance of natural plant food. If you have used plenty of mature compost humus, the material in which your plants are growing will be rich in easily available plant nutrients.

Even so, because satisfactory formation of a heavy root demands plenty of water, you may find it desirable during a dry spell to supply additional water. You will find that it pays to use compost-water, especially when the plants are young.

Compost water is easily made by placing a quantity of sifted, mature compost humus in a large barrel or other container and covering it with water—preferably rainwater.

This mixture should be stirred occasionally and allowed to stand for twenty-four hours. The resulting solution may then be strained off and applied to the plants without danger of burning their roots and causing the formation of useless prongs as so often happens when chemical fertilizers are applied.

Because their roots contain a large percentage of water, the early growth of the salsify is important. Compost water will greatly aid this early growth and insure the establishing of a healthy plant whose later steady growth will cause the formation of heavy, fine flavored roots.

You will find that one ounce of seed is sufficient for one hundred feet of row.

After the salsify has made some growth, it requires little attention. It should be hoed now and then to keep down weeds. The rows of salsify just sit in the sun and take their time.

Salsify grows slowly; just the same it is very hardy; that is, it will persist in spite of great cold. It may be left standing in the garden over winter before you get around to thinking about it.

Perhaps, during the mild days of the winter you will happen to remember the rows of salsify that stood quietly in the midsummer sun. All other garden crops have long since been gathered.

It is then that you will find much pleasure in digging a quantity of the large white roots, after everything else has been destroyed by the blackening damage of winter.

You rinse a few handsful of the roots and bring them into the house.

However, if the winter in your locality is often very severe, you will find it convenient to dig and store a quantity of salsify roots after the first fall frosts have added richness to their flavor. Salsify roots may be stored in the garden in about the same manner as beets or carrots.

In a well drained corner of your garden, that is, at a spot where rainwater soaks away quickly and evenly, make a shallow excavation about nine inches deep. Line this excavation with dry grass, straw, or some similar material and place the salsify roots in a conical pile upon it.

Cover this pile several inches thick with the same material that was used for its

foundation, building it up to a peak. Then place a layer of topsoil at least a foot thick on this covering of straw but allow the peak to protrude and serve as a ventilator. A box or board should be secured on the peak to prevent the entrance of rainwater.

Stored in this way, salsify may be easily gathered during the worst of the winter when the ground is too hard frozen to make digging possible. You will find that several small piles are better than one large one. They are more easily built, the roots keep better, and the entire contents may be removed when the pit is opened.

Perhaps, early the following Spring, you decide to grow more of this fine vegetable—a few extra rows of Sandwich Island Mammoth. You wonder about saving the seed from a few of the fine plants you have grown and which have still not been dug. You rather hated digging them because they seemed a bit finer than the rest of the crop.

If you would use their seed, you will find it best to dig them just as early in the spring as possible and before the plants have started into growth.

The best roots should be immediately reset about four feet apart. They will begin to grow almost immediately and go into the business of producing their seed.

If conditions in your Victory garden are favorable, you will have the advantage of being quite sure that the seed you produce is quite new. This is important in growing a plant whose seed is not viable for more than one year.

You will find that the heads of the salsify require close watching to collect the seed. This is because they open as they ripen and you will have to guard against the seed being carried away by the wind just as soon as it is ripe and before you are there to gather it.

The best way, perhaps, is to gather the opening heads in the morning on rainless days. These may be spread out in some dry place where air circulates freely. When the heads have dried out they may be rubbed by hand and the seed collected.

But whether you collect your own salsify seed, as some gardeners have done for a long time, or whether you simply grow a row or two, your Victory garden will have introduced you to a valuable and interesting plant, one which has long worn the badge of approval upon it by men, like yourself, who have tilled a garden.

Humus and Artificials

By Sir Albert Howard

IN the previous issue of the Compost News Letter (published in England) some evidence was given traversing the notion, now being vigorously put forward in certain quarters, that the salvation of farming and gardening lies in a foundation of humus supplemented by artificials. This view is a clear sign of progress in that it demonstrates the abondonment of the idea that farming can be carried on on Rothamsted lines by chemicals alone. The victims of the NPK mentality are now seeking sanctuary in the humus bombproof shelter. The problem is to evict these unwelcome intruders. This can most effectively be done by recording the verdict of Mother Earth on the new platform.

What is the effect of a dressing of complete artificials on soils made fertile by humus? Can chemicals carry the yield a stage further than Nature does? Can the laboratory investigators paint the lily? If Mother Earth says No to all these questions, the artificial manure industry will have to change its ground once more and devise still another slogan.

Evidence is now coming forward which indicates that artificials produce no appreciable results once the soil is fertile. One striking case was recorded in *An Agricultural Testament* (p. 103) when discussing Mr. A. J. Hosier's results of the open-air system of dairy farming on the Marlborough Downs in Wiltshire. In a letter to me dated April 6th, 1938, Mr. Hosier stated:-

"On my improved grassland, I have on several occas-

ions put down experimental plots of artificial manures and there was no response even when there was a complete fertilizer applied. Before I started open-air dairying on a big scale in 1924, I put down 150 plots and in many places I could write my name with artificials."

Interesting confirmation of these results has just appeared in the South African *Farmer's Weekly* of April 7th last. Mr. N. W. Ayson records his experience of the effect of artificials on a fertile soil as follows:-

"I have read Mr. Viedge's very sensible letter in your issue of March 17, and can tell him that I have been pouring in stable manure and rotten straw into my garden for the last 20 years. At the beginning my garden was just pure yellow stiff clay (just like yellow soap), now it is an almost black heavy loam and does not require any more manure for some years. Thinking to get even better crops I have added to beans, mealies, beet and so on, artificial fertilizer containing phosphates, but this had no effect whatever as against those parts not so treated.

"I understand that Mr. Viedge's district, Maclear, carries the sour type of soils. Such land requires no grass-burning, but thorough cultivation of the soil when cropped, and it should be the object of every farmer whose lands lack humus to put humus into his soils by all means in his power and to sweeten them by cultivation, stocking, and so on. These processes take a lifetime, and then the results are not equal to those lands which are by nature sweet.

"To sweeten sour soils is a long process. I have watched the improvement in my garden with the feeling of being a conqueror, and now growth is rank. Self-sown plants and grasses, which formerly would not have germinated, now come up in profusion; but although such a transformation could not be made by a farmer over his whole farm in his lifetime, why not start and so treat a part of it? Even for the eyes it is a great joy to see everything growing in rank profusion such as one sees in humus-laden forest soils."

N. W. AYSON.

Dalhenyean, Hornsey Road, Mowbray.

Obviously a fertile soil has no need of chemicals. But examples without end are needed to drive this point home and so expose an impudent device to persuade the public to spend their money in the hope of increasing crops beyond the natural limits set by Nature.

Sprouting Oats for Chickens

By J. I. Rodale

WHERE chickens are kept indoors, and for chickens in winter when green range is not available, sprouted oats and other grains are very valuable. At our own farms here we use the regular chicken mashes very sparingly, and when our earthworm breeding schedule begins operating, sometime in August or September, we expect to do away with mashes entirely. We will feed them earthworms, grains, etc.

In sprouting such grains as barley, wheat, oats, etc., there is a tremendous increase in vitamins. Of all these grains, however, oats show the biggest increase in vitamins when sprouted, and chickens go for it in a big way.

There are many different ways of sprouting oats and we will describe a few. Edgar Briggs in an old book on poultry keeping says:

"I will now tell you of one of the most wonderful feeds known at the present time. Positively one of the greatest egg producers ever discovered and something that will make eggs hatch any time of the year. Oats to a hen is what oats is to a horse. What would a horse be worth without oats? But very little! The main objection to fowls is their very tough hull, which is very hard to digest, and for this reason alone many people will not feed them to their hens. I have experimented very extensively with oats and have fed them for weeks boiled, with no results in eggs. They

make a very good fattening feed when boiled, but of no value for eggs—simply puts the hens out of laying condition. But when processed, hens eat them in preference to anything else. In fact, they will eat them when they will touch nothing else, while on the other hand, they are the last things eaten by the hens in their natural dry state. I will now tell you how to process them.

"Take a pail of good, ordinary oats, same as you feed your horses, cover them with water and let them soak twenty-four hours, (soak oats only 5 hours in summer), then turn them in a larger pail, one that will hold double the amount. First bore a ½ inch hole in your pail before turning them in, so that it will not hold water; leave in this pail until they sprout thoroughly and begin to germinate heat, which will be in three or four days if in a moderate warm place. Always keep covered with an old bag and stir and sprinkle with water once daily. After they become a mass of roots turn into a box holding about 5 pails. The oats should not be over three or four inches thick in the box. This must also have a couple of 1-2 inch holes in bottom so water will quickly draw off when you wet them each day. They will grow very rapidly when they begin to sprout and are at their best for feeding when sprouts are ½ inch to 1 inch long, and one bushel will make from four to five bushels if oats are good and grow as they should. Always keep oats covered with a heavy bag or old blankets to keep them warm for they will grow much faster, and your sprouts will remain white and very crisp. By feeding when sprouts are only ½ to 1 inch long you not only get the value of your oats, but they also take the place of green feed, and there is nothing I know of which will start hens laying so quickly and will make so many eggs during the year. Give your layers twice a day all they will take.

For growing young chicks there is nothing like them. Give young little chicks all they will eat three times a day after they are a week old. They are at their best for little chicks when sprouts are ½ inch long.

If possible always grow them in a cellar, but in warm weather they can be grown under open sheds, under trees or north side of buildings.

Now for a large plant where you must grow them in large quantities you will find a butter tub a fine thing to soak them in. They can generally be gotten at a grocery store. You fill your tub three-quarters full of oats and fill up with water, let them soak twenty-four hours, then turn in a barrel that you have put a couple one-half inch holes in so water can drain off. Now if you soak two or three tubs at a time you can dump them all in one barrel, and leave them in this barrel until they sprout and begin to heat. They should be thoroughly wet every day so long as they remain in the barrel, and as soon as they germinate heat they must be dumped in boxes that have holes in bottom say three to five inches thick, and wet and turned daily until ready for feeding. If they get too hot in boxes cool down with cold water and spread out thinner. To have them at their best you should start a lot every day and keep them fed up as fast as they get fit. You will soon learn just how many to start every day. I, as an experiment kept two pens of leghorns six months on this processed oats and beef scraps in front of them and no other feed and they laid well all that time and went through the earliest moult of any hens on the plant. Although I do not advise feeding them alone. Now if this falls in the hands of one who has no cellar to grow their oats in, nor a warm place in winter, they can be grown in an open shed or barn by piling up a foot or more of horse manure and setting your box on it and bank your box on all sides with horse manure, put on a board cover and throw over this a blanket and you can easily grow them in such boxes during the coldest winter weather. You can grow them much quicker in winter time by wetting them with warm water, but in summer time they should always be wet with cold water. They also make a great feed for ducks. I give my old breeders all they will take noons and my little ducks after ten days old all they will take three times daily. Now remember there is nothing that will grow chicks so fast as these processed oats, nothing so cheap for when they grow at their best they can be grown for very little cost, and there is nothing that will make hens lay so many eggs nor such fertile eggs. This feeding system alone is worth hundreds of dollars to any one with a big plant, and for small yarded plants it solves the green feed question entirely and will make any plant pay a profit. Leghorn pullets can be grown and put to laying at

four months of age on this feed. I have also done it with White Rocks and White Wyandottes.

In a recent article in Country Gentleman an oat sprouter was described which consisted of a table two feet high, about two feet wide and as long as is convenient. Small holes are made in the table for draining off the water and keeping up a flow of air. So that the grain will not fall off the table, boards are placed on all four sides extending about four inches above the top.

The article then continues:

A sack holding oats for a day's feeding is put in warm water and allowed to soak for 24 hours. The soaked oats are then piled on one end of the table and left until germination is well started. Each following day the same quantity of oats is treated in the same way and piled on another section of the table. After germination has begun, the oats are spread about 2 or 3 inches thick on the table; and each day thereafter they are watered and turned with a shovel until the roots become matted together, by which time they are ready for feeding. It is preferable that the oat sprouter be set up in a room in which a temperature of about 70° F. may be maintained and lights may be turned on for about 8 hours in each 24 hours.

Until the shortage of metal became acute there was on the market the Keen Oat Sprouter which consisted of seven oat trays, mounted on a metal frame, one above the other. There were holes in the trays which permitted the water to drain out into a pail at the bottom. Their catalogue states: "Fed to a breeding flock, sprouted oats have been proven to increase the fertility of hatching eggs."

I. Putnam of Elmira, N. Y. makes an inexpensive oil burner for sprouting oats which cost but $2.00. However, their manufacture has been discontinued for the duration.

The methods described above are for sprouting oats without placing them in soil. The late Dr. Oliver, who developed the soilution earthworm now being bred by the California and Ohio Earthworm Farms and also Dr. Barrett, advocates sprouting oats in a tray made up of one-third earthworm castings, one-third peat moss (or substitute, possibly compost) and one-third oats. The earthworm castings would be available only to those who are breeding earthworms.

Another method would be to sprout the oats in a mixture of rich compost and top soil.

In a previous article I described a method of breeding earthworms in boxes for feeding to chickens. At a certain point, 5 or 6 months after the start, a box a day is fed to the chickens. The earthworms are kept in a mixture of humus, rich soil, etc. This residue material, which remains after the earthworms are taken out would make a good medium for sprouting oats.

Bacteria

By H. C. Haas.

MANKIND and all the animals and birds which live above the surface of the land areas of the earth, and all the plant life which lives partly above and partly below the surface, have for millions of years been in unconscious partnership with all the insect and bacterial life that exists in continual darkness below the surface, having no defense against present wide destruction except man's thoughtfulness. Man's thoughtlessness and thoroughgoing technological advance, and that of no other earthly creature, have, by fire, by poison, by deep ploughing, by road building, by city block building, by mining and by chemical industry, destroyed these under surface partners of ours over a large percentage of the millions of square miles of our North American continent, and similarly on other continents, no race of so-called high civilization in ancient or mod-

ern times being guiltless. The number of soil bacteria that can normally exist even under only one man's two feet are legion.

Pasteur and others discovered and described microscopic life. Since his time it appears to have become civilized man's obsession to protect himself against bacteria, particularly the pathogenic (dangerous) kind, by sterilization, using heat and strong chemicals, hermetically sealed tin cans and bottles, pasteurization, preservatives, sewers, aqueducts, rat extermination, rubber gloves, waxed paper and cellophane. The race existed a million years before the time of Pasteur and microscopes, without all these, though plagues, more destructive of life than the present war, were common. Dr. Victor Heiser and other men like him, in the Philippines and elsewhere in the Orient (see "An American Doctor's Odyssey") ended widespread plagues of many kinds (bubonic, yellow fever, cholera, leprosy, and others) by keeping plague bacteria from human beings, using some or all of the means just listed.

It is next to be debated whether too much shielding from bacteria is desirable. The body will have no need for developing anti-bodies, a provision that nature has taken ages to build up. The bacteria in general claim the weakest. Nature's protection may be weakened and found wanting when badly needed.

It has not yet completely entered man's consciousness that bacteria might be necessary as well as destructive to him. This each-for-himself attitude that has characterized the actions of too many of us, a trait inherited from our ancestors, the fish, has prevented co-operation between man and man as well as between man and microbe. Bacteria and other men have been creatures to mistrust, defend ourselves against, and destroy, not to befriend and employ as co-workers.

Study of the bacteria, earthworms and all of the other minute creatures which normally live a crowded and teeming existence in the dark topsoil has hardly begun, because its importance has not been realized. Darwin began the study but the followers have been too few. We have been building railroads, turbines, diesel tractors, automobiles and aeroplanes besides making tin cans and rubber gloves, praising our inventiveness and Buck Rogers tendencies, while the topsoil has been disappearing under our feet. The Futurama at the New York World's Fair was too big to show bacteria and earthworms. Darwin, Sir Howard, and Dr. Pfeiffer, looking at the ground with microscopes instead of aeroplane cameras, are leading us in a new direction. Our salvation must be found in a way of which we never dreamed.

Mankind, and all other living creatures, in war or in peace, must have food. The continued supply of food is based on the preservation of the earth's topsoil. The earth's topsoil must live on.

Japanese Beetles for Chickens

One day last Summer while sitting near my house, I watched three bantam chickens running up and down the lawn catching and eating the Japanese beetles. They were at it practically all day long, all through the season.

The lady who owned the bantams also kept other poultry. She used to take a pail and put a little water in it, shake the beetles from the grape vines into the water and then dump the beetles on the ground in her henyard. The hens would eat them before they could fly away.

The robins also pick the larvae of the beetles out of the ground and eat a great many of them. The birds and the poultry certainly seemed to thrive on Japanese beetles.

W. W. P.

From the Rural New Yorker

We have been feeding Japanese beetles to our chicks since we noticed this item in the Rural New Yorker and it seems to be working out excellently. About the only place where we have them is on the grape vines. By constantly combing the vines for them it keeps the pests in check. At the same time keeping the chicks happy, while giving them exercise fighting for the beetles.

Peat Moss

"GARDENING with Peat Moss' by Rockwell and Wm. G. Breitenbucher (Bruce Humphries Inc. Boston $1.10). This little book is packed with factual information of great significance to the organic gardener.

The authors suggest that because raw manure is scarce, peat moss may be substituted. Raw manure is valuable not so much for the small amount of plant nutrients it contains but for the very large amount of moisture holding humus. Peat moss, containing almost no food value, can absorb about seven times its own weight of water.

Since every pound of dry material produced in your garden requires from 550 to 950 pounds of water, it is important that you have material surrounding the roots of your plants that will have the ability of making this supply readily available.

Much of the ability of peat moss to promote plant growth is probably the result of its ability to secure plant nutrients formerly locked up in the soil and to supply the moisture necessary for the convenient presentation in soluble form.

Peat moss was formed ages ago by the accumulation of deposits of sphagnum moss, a moss much like that which today forms the "tundra". It was composted by Nature under water. Its plant food value was lost. What remains is a fine, fibrous, spongy, organic substance which is dried out before shipment.

When a soil into which a moderate amount of peat moss has been dug is filled to saturation with rainwater, the excess water does not run off, erode, or cake the surface, it passes into and through the soil. In this way it delivers to plant roots additional soluble plant food.

As you will quickly realize, this excellent surface drainage does much to prevent the "damping off" of seedlings and beneficial soil bacteria are also greatly aided by the good drainage.

Used in large quantities, peat moss shows a slightly acid reaction. Very small quantities of lime (1/4 pound to a cubic yard of peat moss) will definitely offset this slight disadvantage.

Its tendency towards acidity makes it doubly valuable in the planting of blueberries and other acid loving plants. Blueberries and rhododendrons, in fact all the members of the heath family, do especially well from rooted cutting to maturity in soil to which much peat moss has been added.

In the matter of transplants peat moss especially demonstrates its value. The authors demonstrated this very neatly. In soil near the seashore which was composed of little more than sand and stones and in which weeds refused to grow, holes were dug and filled with peat moss. Into these holes tomato plants which had been raised in peat moss were introduced. Care was taken to supply plenty of water containing the necessary plant nutrients and the plants thrived. As you will see in the illustrations, these plants developed roots over six feet across.

In this little book you will find many very interesting suggestions from the growing of house plants to the greater success with garden lilies, rooting cuttings and growing seedlings. Although as an organic gardener you will likely have started wondering about many things. You wonder especially about compost material and how it would compare sphagnum moss composted by Nature under water.

You are naturally very interested to see the many ways in which peat moss has value and the manner in which it has proven more effective than washed, sharp sand or a mixture of sharp sand and leaf mold.

Containers are made of peat moss pressed into desirable form so that the container may be moved with the transplant and later on, when the roots of the seedling penetrate the container, be broken down and form available humus.

Our Government recognizes the value of peat moss. It is available now to growers of food crops and we have much native peat moss waiting to be

used. Formerly the poorer grades of peat moss were effectively used as bedding for animals. When it had served this purpose, and in the process become loaded with a very valuable supply of plant nutrients it was used in the field. It was also commonly used by wise farmers to form layers in the manure heap to prevent the leaching away of great quantities of valuable material, for peat moss not only has the fine quality of hanging on to water it also has an affinity for ammonia and prevents its evaporation.

On heavy soils it is best to place the peat moss near the surface; on light soils it should be well dug in to form a reservoir. Peat moss will never burn roots as will artificial fertilizers and no amount of artificials will take its place.

For many years great interest has centered around the remarkable ability of peat moss to stimulate plant growth. Some observers, notably Bottomley and his co-workers, believed that peat moss contained some organic substance which they had failed to isolate. They called this growth-promotion substance, this unknown bacteria, "auximones" —auxiliary bacteria.

Of course, as an organic gardener, you will draw your own conclusions. Peat moss is the husk and shell of what might have been rich composted material. As you know mature compost material has very fine water holding qualities; in it seeds sprout and seedlings grow almost twice as well as in ordinary topsoil. Peat moss contains the husk, mature compost humus contains also readily available plant nutrients.

In the end you might ask whether or not the mystery of plant growth in peat moss and the "auximones" might be explained by showing that the spores of the mychorriza, so essential to all plant growth, might still exist in a dormant condition waiting for the arrival of new plant growth and congenial conditions.

You wonder what becomes of bacteria favorable to plant swamps when the dripping layers of sphagnum moss were obtained. But above all you think over what you know of the value of mature compost humus as compared to peat moss and appreciate more deeply than ever the value of the properly constructed, humble compost heap.

The Warbling Worm

By Jim Miller

LONG before man conceived the idea of tilling the soil, the seemingly insignificant earthworm was busily at work plowing, harrowing, and fertilizing the land. Nor did it overlook the importance of drainage and the addition of amendments—factors of comparatively recent development in the management of the soil by man.

It was estimated by Charles Darwin that, in garden soil in England, there are more than fifty thousand earthworms in an acre, and that the whole mass of vegetable mold which is spread over the surface of the earth passes through their bodies once in the course of about every four years.

This agricultural work of the earthworm has been going on for countless years. Wild land owes much of its beauty to this diminutive creature which keeps the soil in good shape. The worm has undermined and buried rocks changing greatly the aspect of the landscape. It has preserved ruins and ancient works of art. Several Roman villas in England owe their preservation to the earthworm. All this laborious and unremitting toil is accomplished with the most primitive tools, a tiny proboscis, a distensible pharynx, a rather indeterminate tail, a gizzard and the calcareous glands peculiar to this lowly creature.

And yet there is probably no living thing on the earth which most of us think of as being more dumb, in both the legitimate and the colloquial meaning of the word, than the bashful and meek earthworm. Still, it wasn't very long ago, that a learned German professor made the astonishing statement that these retiring creatures not only possess a greater degree of intelligence than they heretofore have been credited with, but that they actually are the proud owners of

voices. These voices are used in emitting faint sounds, rarely in a solo number but generally in series marked by a definite and changing rhythm.

So apparent is this rhythm, that it leads to the conclusion that these sounds are broadcast with the object of communication. When within about twelve feet of the worm, these sounds—resembling the clicking and ticking of a mass of infinitesimal clocks—can be heard quite clearly. The human equivalent of this utterance might be produced by the consonant D combined with any of the five vowels. The timbre in which the worm's snapping aria is rendered is generally not pure. Their vocal efforts run more to noises like di, de, and da, with the more muffled sounding du, and do, coming in to action less frequently.

There are times when the noises produced by these creatures of the dark vary; but the cases are very rare. At such moments the sounds emitted are similar to those echoing from the blows of a minute hammer on a piece of paper drawn taut, or a diminutive flute. Although it does happen that single sounds are frequently heard, they are mostly arranged in entire series of changing figures.

When sounds are heard that are in single series, they invariably are on the same note and generally of equal rhythm. Sometimes, however, there is a lightning change. The stops between the separate sounds within the same series as a rule are of the same length, but there may be a connection between this series and a second series, and, very often, with a third or fourth series in which the pauses are either curtailed or prolonged. Again, there are times when so rapid is the succession of sound pouring forth from the aspiring earthworm, that they compose a sort of trilling or buzzing effect.

The question naturally arises: How are these tones uttered by the earthworm? For the time being that secret remains buried in the flat bosom of the obscure little creature as these sounds are emitted only while they are laboring industriously in their burrows where it is extremely difficult to observe them. The German professor, however, has ascertained that these snapping reports are not produced by chance, but are voluntary noises made by the regular opening and closing of the cavity of the mouth. To prove that they are not connected with eating, he points to the fact that they are heard to issue from terrariums which are loaded solely with sand and totally free from humus substances.

Has the angleworm some definite object in uttering these discordant broadcasts? Do they signify any relationship with the changing character of the work, now simpler and now more involved? Is it seeking to burst forth in "self-expression?" Can it be that this is a method of communication with other worms at work around it, or are the utterances to be classified as mystic calls or lilting love notes?

It was while making a general study of the intelligence of earthworms that the German professor chanced upon this extraordinary discovery. He almost keeled over when he heard unexplainable noises coming from an earth-filled enclosure which he had erected for experimental purposes. For a while he was exceedingly incredulous, but at last he was compelled to conclude that earthworms were capable of producing definite and distinct sounds.

There are certain other discoveries concerning the habits of the earthworm which were made by C. Merker of the Giessen University, several years ago which are of great interest. He claims that the motive which forces the worm to ascend from his underground dwelling to the surface of the earth, water-covered or even snow-covered though this may be, is not for the reason that has generally been assumed—the desire for moisture, but the danger and threat of suffocation beneath the ground when the latter has lost some or all of its oxygen. Water is absorbed into the earth very slowly, but it doggedly penetrates into the most tiny apertures of the soil, mercilessly evicting the air contained in these. Of course, some amount of oxygen is brought down into the ground with the water.

This oxygen is put to good use by the humble worm who is not afraid of water; unfortunately, however, the amount is pitifully meager and there are myriad hordes in its use. For all the many worms, larvae, bacteria, fungi, and rootlets which occupy the stratum of humus have avid need of oxygen to exist. All of the subterranean denizens endure pathetic privation until the cessation of rain, the water has drained away, and a fresh supply of air has made its way through the crevices of the ground. Being hard put to catch its breath, the earth-

worm frantically seeks to flee from suffocation. Should the ground beneath him be plastic enough, he bores downward with frenzied anxiety into the lower layers which still contain some oxygen. Should the ground be solid and hard, however, the worried worm is unable to penetrate down rapidly enough to escape the descending water from above which loots him of the air for breathing. If this occurs, he has no alternative but to retrace his path and delve upward. It makes no difference if he is greeted by rain or snow above ground.

An extremely unusual and remarkable observation which has for many years obfuscated naturalists is made clear by this. This relates to the abrupt appearance upon the surface of a layer of snow about eight inches thick of an immense congregation of assorted-sized earthworms. This was most enigmatic when it is considered that the skin of these worms is so delicate that they have the greatest need of warmth, and for this reason generally pass the winter deep underground in the arms of Morpheus.

Another of the torments which these little fellows are subjected to is light, which they flee whenever they can. Even in murky, rainy weather the light is penetrating enough to incapacitate the eyeless worms, which are adapted to existing in the dark. And not even the feeble and paltry amount of illumination of a wintry day can be supported for any length of time by them. This makes it apparent, then, that when the worms are compelled to ascend to the surface of the ground in the summer on account of being oxygen-starved, they are rapidly affected by the light, which saps their strength. In such a case, even the veriest makeshift of a puddle is welcomed by the worm who will twist and squirm and turn and dig in an endeavor to trouble the water so as to block off some of the light.

It can be seen then, that happy indeed is the worm that will find a pool in its path, no matter how mean the size.

What Disease?

By Juan Amon-Wilkins, D. N. Sc.
The First Naturist Resort,
Isles of Pines, Cuba.

ONE of our native farmers was weeding around our citrus trees during the peak of our winter dry season, and on seeing some of the leaves yellowish in color he remarked, "Necisita comida" or that our plants needed food, so that I asked him, merely to put across an idea, "What food do they need?" and he replied, "Quimicos".

"What sort of chemicals would you give the trees?" was my next question, and he replied:

"The chemicals sold in the fertilizer store."

"Should I add these chemicals what would happen?"

"The plant would grow fast, the leaves would get a green color, and the trees would bear quickly."

"How do you know this?"

"I have worked for the American citrus fruit growers and this is the way to do it."

"Do you think that in this severe dry spell, the leaves would become green after the adding of these chemicals?"

"No, you would have to pump plenty of water around the trees like the American growers do."

"Ah, ha!" was my reply, "but suppose I should pump water around the trees, wouldn't the leaves become green without the fertilizers?"

"I suppose so."

"Then don't you think the real cause is the lack of water or moisture rather than chemicals or food?"

"Yes, I suppose so."

"Do you know that I have quite a bit of food around the plants?"

"Do you?"

"Yes!"

"Chemicals?"

"Yes."

"Commercial chemicals."

"No."

"I thought you didn't use

them."

"That is right. Have you seen some of the other citrus groves recently?"

"Yes, why?"

"Didn't you notice that those trees in groves not equipped with sprinkling systems are shedding their leaves on the lower parts of the branches, too?"

"That's right, now that I think of it."

"Do you also notice that there are hundreds of other trees doing the same thing at this time of the year?"

"Yes, that is so."

"Then the cause of the yellow leaves on the lower parts of the branches of our trees is due to lack of moisture to take nutrition to the older leaves, and of course they die and fall off; the smaller or younger leaves are green. Nature works that way. In the tropics in the dry season when there is lack of moisture in the ground. the trees shed their leaves. In the temperate zone when low temperatures cause freezing and frost, the leaves are robbed of nutrition as the sap goes into the ground and inside of the tree. and the leaves fall off rapidly and completely; but it is not so in the tropics, they fall off gradually and new ones sprout simultaneously, but if we have unusually heavy rains or unseasonal rains in the dry season, the leaves remain green, and only the older ones that have been flayed by strong winds and cannot assimilate nutrition fall off."

"But your citrus plants need food; they must have chemicals!"

"Why do they?"

"Because all the Americans use chemicals for their citrus groves."

"Tell me, do they use chemicals for their other trees?"

"No, they don't need chemicals, they grow and bear fruit without commercial chemicals."

"Did you ever try using humus to fertilize citrus trees?"

"No, I would have to wait too long."

"Do you think so? Do you know that I have trees producing fruit here in less time than the commercial-fertilized trees?"

I took him to a breadfruit tree that had borne fruit twice in three years, also a mango tree, lime trees and finally some grapefruit trees. He couldn't answer or say another word.

"And, furthermore," I added. "these trees that are shedding their leaves are going to blossom soon."

"Maybe so, amigo!"

In a week or two we had a very good rain, and then a few showers alternately in the following three weeks, and to our pleasant surprise other citrus trees were blossoming for the first time, at the end of the fourth year, yet these trees had been neglected. They were planted in stony soil and had not been fertilized with humus until three years after they were planted, but I had tried an experiment that indicated early production. We used plenty of humus on the trees. The results were remarkable. I dug around the trees with a trowel a few months later and found earthworms crawling in every direction below the mulching. The former rocky, compact earth was moist, soft and porous.

The fact of the matter is, that people like this simple native farmer, who is interested in planting tubers, corn, beans and raising pigs, are deluded into thinking that citrus trees are differently constituted, that they have an inherent right to be fertilized with commercial fertilizers. Of course, they have not had the opportunity, as I have to have been reared in a tropical jungle, where I have seen giant trees whose ages might well be over a thousand years. They have not walked through these forests where you are unable to see the sunlight for hours at a time, where the leaves, bark, branches, seeds and other debris fall to their earthen resting place; where they decay and are acted upon in their decomposed state by the wonder workers of the bacterial kingdom, as well as by the earthworms, whose nitrogenous excretions are the nutritive elements rendered osmotically assimilable through the roots. If these aged giants of the jungle, like the great redwoods, of the West, are able to subsist in health and strength on humus, why shouldn't citrus trees?

The gullibility of man is a disease. He, too soon, and disastrously so, is psychologized with error through high-powered sales talk. He learns error because he doesn't take the time to observe the truth within his grasp, and although he becomes a slave to his errors and suffers many privations, he is so set in his fixations that it is hard for him to change.

I was taken to a farm recently to treat a sick friend, and as we drove through various orchards, my friend, a citrus grower, began talking about citrus groves. He pointed out the various ones that were fertilized with chemicals, how polluted the leaves were. Then he showed me extinct groves that had perished by certain

diseases. "What disease?" I asked him, and he candidly replied, "Stupidity". "But they don't learn", he said, "for after thirty years, they still pour on the sulphur, brimstone and fire, and they plough deep, the deeper, the better, they say. Even in the dry season with such a lack of moisture, and even though they pump water, and more water, it is still too dry. They burn up everything around the plants; not even bacteria can live, far less earthworms. Look at my grove, the leaves are clean, the ground is 'dirty', sure; it is full of trash, humus, grass, leaves, all sorts of junk, but the earth is full of bacteria and earthworms. It is moist, mellow and lovely to handle. My fruit is sweet, and beautiful. I don't have to spray anything. Why should I spray? How do I know that those bugs shouldn't be there. I learned to let them alone. Of course, sometimes I hate to see the birds go after the worms, but they too have to live. Oh, it is wonderful when you have love for your plants. But they think I am crazy! Having love for plants! All they talk about is how much money they will make after fertilizing. Yes, I treat them right. I don't burn their rootlets with chemicals, nor do I take a horrible plow and cut their toes. Think of having someone cut your toes, cut your foot! For it is the same thing. Those roots are living. They take up the food from the soil, but how are they to take up this food when you keep annoying and injuring them every year with plows. Then they clean their groves, so that they look pretty, and the sun bakes the exposed earthen shoes, and the toes of the trees are pinched. Doesn't it feel nice to soak your feet in the moist soil in the dry season? How do we know that the roots don't like to feel the soil, moist from mulching; its coolness and lovely odor is delightful. Yes, I don't douse their leaves with arsenate of lead. How do we know that they want to be sprayed with poisons? How do we know that this poison doesn't harm the tree and the fruit and cause them to die. I love my trees, and they love me. They respond to my affection, but I am supposed to be crazy, my trees are healthy, and they live and produce. What disease? Man's stupidity!"

Government of South Africa Recognizes Value of Compost

Publicity Series No. 4.

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Conversion of refuse into soil fertility.

IN view of the important role played by compost under present conditions in maintaining soil fertility, steps are being taken at present to make compost on an extensive scale for agricultural purposes.

In the past, farmers had a large number of different fertilizers available for improving the production capacity of their soil. Owing to the difficulties which are now being experienced in connection with the importation, the resultant shortage of fertilizers has now compelled farmers to make use of substitutes. Extensive use was made of kraal and Karoo manure, but the supplies of these are not unlimited. Furthermore, the transportation of these bulky substances over long distance involves serious difficulties. This combination of circumstances clearly stresses more than ever before, the importance of compost in maintaining soil fertility. By making or using compost made by himself, the producer can utilize his limited supplies of

kraal manure and fertilizers to better effect in maintaining his production of essential foodstuffs and also the productivity of his soil at the desired level.

Municipal Refuse

Well prepared compost may be considered equal to natural fertilizers. What is more, it is undoubtedly of the greatest value for the cultivation of vegetables, potatoes and other crops which require large quantities of organic material. Under irrigation, especially, the application of compost is of paramount importance in keeping the soil structure in good physical condition.

The Department of Agriculture and Forestry has made every effort to encourage the making of compost, and producers on whose farms demonstration experiments have been carried out are convinced of the possibilities of compost making. It has now become imperative, however that these operations should be undertaken on a very much larger and more comprehensive scale so as to utilize all waste material to the greatest possible extent for the maintenance of soil fertility. Consequently, the fact is taken into account in this scheme that large quantities of waste material and night-soil which can be converted into compost thereby making good the fertility sacrificed in the production process, are constantly available in our cities and villages to which practically all our farm products are sent.

Division of Union into Areas

The scheme, therefore, makes provision for the conversion into compost of municipal refuse, as well as the refuse from military camps. This work will be carried out under the guidance of Mr. J.P. J. van Vuren who achieved such great success with the making of municipal compost in Ficksburg.

During the past week several officers met at Ficksburg and there inspected the municipal compost-making undertaking which was discussed in all its phases. In the near future they will organize their whole plan of campaign. In the meantime an urgent appeal is made to all municipal authorities in this country to give serious consideration to this method of disposing of refuse and night-soil whereby waste products will be converted into valuable fertilizers.

Compost Making on Farms

Another part of the scheme makes provision for the making of compost by farmers themselves. For this purpose, field officers of the Department of Agriculture and Forestry will be made available and a co-ordinating officer appointed so that farmers will be able to tackle the making of compost in a vigorous manner. Our fertilizer position makes it essential for every farmer to pay serious attention to the making of compost. Information with regard to the value and methods of compost-making is obtainable from colleges of agriculture and extension officers, as well as from the Division of Chemical Services.

This scheme will involve new experimental work which is to be undertaken by the Department. In addition, investigations are being carried out at present in connection with the actual cost of the various methods as influenced by the different raw materials used and the different conditions under which the compost is made.

Reader's Correspondence

Dear Sir:

Where are the egg capsules of the earthworm deposited? Are they found among the castings just above their holes in the ground?

What is the difference between "earth-worm" and "eel-worm"? In my childhood I have always heard the names used interchangeably.

Yours truly,
Rev. C. Lamar Glenn
Waverly Hall, Ga.

Answer

Dear Reverend:

Replying to your letter of June 17th, earth-worm capsules are deposited lower in the ground and are not found among the castings.

There is a tremendous difference between earth-worms and eel-worms. Eel-worms are microscopic eel-like organisms which are so small that they are hardly seen by the naked eye. They usually attack soils and plant and animal tissues. The earth-worm is, as you know, anywhere from two to eight inches long. Eel-worms

are much like the parasitic type of worms that infest the intestinal tract of people.

Gentlemen:

I have just weeded a large lot and piled the weeds and am watering down each night. Should I put lime or other composition on the weeds, as well as to wet them down, to hasten rotting of them.

Should also like to know if one can make compost pile with the weeds as well as the heavier weeds (?), such as milkweed, which when left to grow has a rather heavy stalk and seems more or less woody.

I have buried much of the weeds but have accumulated this pile and would like to know how to work with it, i.e., to use it as a fertilizer, etc.

C. S. Stanton
Oakland, California

Answer

Dear Mr. Stanton:

Piling weeds by themselves would not be the best way to get them to decay. It will take years. By following the instructions contained in the little circular we have sent you and using a small amount of earth along with kitchen waste and if possible, some manure, you will really hasten the rotting of the material.

If you do not have manure and your kitchen wastes contain some animal matter such as fish or meat cuttings, that might do. Otherwise, you might purchase such animal fertilizer material from local fertilizer companies such as bone meal, tankage, etc., which you would sprinkle lightly in the heap by layers.

If your weeds are heavy and woody, you would have to crush them before using them in the compost heap. It does not matter if the weeds are heavy so long as they are green but if they have a wooden stem, you will have to see that they are crushed before using.

Dear Mr. Rodale:

Recently you mentioned that Gypsum was unsuitable for the organic program, but here in California, I was advised that it was more effective than the Calcium carbonate, and I am enclosing a leaflet on the subject of Gypsum, which is of course propaganda by a company that has it to sell, but I find the county agriculture advisor and others sharing their idea. I had to tear down some plaster walls, made of the old style lime plaster, and I am mixing it in the compost heap, for this gumby soil also needs the sand added. Benjamin Franklin made the recommendation that plaster should be spread on the soil, and proved it by writing out the words on a lawn, and wherever the letters were written with lime, the lawn grew more luxuriantly.

Sincerely,
H. Skadsheim
Mt. View, California

Answer

Dear Mr. Skadsheim:

The trouble with Gypsum is that it contains sulphuric acid and is a strong fertilizer. It definitely acidifies the soil rather than alkalinizes which is what lime (calcium carbonate) would do. In the days before chemical fertilizers were known, Gypsum was widely used.

Gentlemen:

1. How many tons of compost must be used per acre to give results to the average corn belt land?

2. Without considering the cost of material how much labor is required to make average collection of waste and how much labor to handle and spread good waste?

3. Do I understand correcly that composting destroys harmful bacteria in night soil —garbage and dead animals and make them safe for use on underground vegetables?

M. M. Burdick
Lake Bluff, Ill.

Answer

Dear Mr. Burdick:

1. There should be used at least ten to twenty tons per acre of compost.

2. We do not have any figures on labor required to make the average collection of waste. We would not spread waste until it was decayed unless it be such a thing as spoiled hay or straw which would be spread on the land and allowed to stay as a mulch for a period of about a year. Such a mulch permits the earthworms to multiply underneath, traps water and has other advantages.

3. This is a controversial point. It is not quite sure whether compost would destroy such bacteria as typhoid if they were present in night soil. Garbage and dead animals are safer than night soil but after research is done in this country, it is possible that with the proper system of composting, night soil might be considered safe. Temporarily we do not recommend it.

Dear Sirs:

The end of May I had put in about an acre of corn on freshly ploughed sod. The corn sprouted, but after about a week or so it was bitten off at the base of the stalks. Some people make the crows responsible for it, and others blame the cutworm. Now I bought a crow repellent in the hardware store, a liquid with which the corn has to be mixed before sowing, and which gives the shoots supposedly a taste that crows don't like. It seems to be an irritant, because a caution reads not to get it on the face or any tender parts of the body,

Of course, as much as I hate to use such materials, I see myself forced, on account of the late season to do that this year anyway, and replant the corn that way. However, I would appreciate your comments on this peculiar situation, and what can be done in the future. Since composting is a sort of slow process, I will still have to rely to some extent on fresh manure and lime in some years to come.

Your suggestions would be greatly appreciated.

Very truly yours,
Herman Deinzer
Glen Gardner, N. J.

Answer

Dear Mr. Deinzer:

In your letter you state that "the corn sprouted but after about a week or so it was bitten off at the base of the stalk". Presumably the shoots were cut off near the ground and *left where they fell.*

This would seem to point to cutworms as the culprits. But if the shoots were bitten off and *entirely removed* one might suspect deer, rabbits, or a number of small animals. If the shoots were shrivelled near the ground and had fallen over, one might be led to suspect wilt.

In any event, it would seem the crows were not guilty since they would have *pulled up the seedlings, roots and all* in their search for grubs, cutworms, etc. and later have tossed them aside.

Cutworms and grubs commonly infest newly turned sod. As you know sod should be ploughed the fall preceding planting to avoid just such conditions. When this is done ground formerly grown to grass is excellent for the use of such rugged plants as corn.

Perhaps the best plan in your case would be to give the area a thorough harrowing and thus expose the white grubs, cutworms, etc. to their natural enemy, small birds. The area should then be reseeded to a different variety of corn—some wilt resistant variety—for there still remains the possibility that the trouble may have been caused by some form of wilt.

In the absence of positive eyewitnesses, it would not seem necessary to resort to chemical crow repellent. Give the area a good going over and the cutworms, lacking protection, will quickly cease to be a menace. Seed when treated with strong chemicals may cause some of it to be transmitted to the matured plant and seed.

It is good to learn that you are interested in organic gardening. Even though you may be unable at this time to do much composting you will find some knowledge of the principles involved of very great value to you in the cultivation of your farm.

Please advise whether, in your opinion, it adds to the fertility of the soil if one buries green vegetation between the rows of growing plants. Please remember that the green vegetation has not been composted.

Also advise whether the mixing of hydrated lime with this green vegetation is an important factor in the building up of the soil.

Ely Straus
Dallas, Texas

Answer

Dear Sir:

Replying to your letter of June 16th, it is better, of course, to compost this green vegetation before putting it in the soil. However, since you are going to put vegetation between the rows where no crop is growing, there wouldn't be any harm done. The advantage is that this vegetation would decay so that by the time your next years crop goes in, it would be available as humus. Another value of this method would be that it would aerate the soil and permit the trapping of rain which would communicate itself to the rows where your crop is growing. Mixing hydrated lime with this green vegetation would be of some value.

Is there any evidence as to the difference in the value of rain water for garden watering as compared with water from the city water main?

It occurs to me that rain

drops gather up particles of dust and micro-organisms in their fall through the air. This is why the air is so clear after a rain. The Bible speaks of "clear shining after rain". It seems reasonable that such water might have greater biodynamic value than water from the city main.

Sincerely yours,
C. A. Rowland
New York, N.Y.

Answer

Replying to your letter of June 10th, rain water is much more valuable for gardening as compared with other waters. You are correct about rain drops gathering up particles of dust and micro-organisms in their fall through the air. There is much valuable material which comes into the soil through rain, which includes sulphur and other mineral elements. Municipal water systems use chemical safeguards which are not good for the soil. For that matter they are not good for the persons who drink them either, but they are the lesser of two evils as far as drinking water is concerned. Pond water, for the same reason is better than tap water, except where there may be factories polluting them.

Dear Sir:

1. Along the highway and the railroad that traverses my farm grows an abundance of sweet clover and other grasses and weeds. Can I utilize these as organic fertilizers and how?

2. Within 1/4 mile of my barn, where I house 10 head of cattle, 2 horses and several calves, are tons of mixed pine and hardwood sawdust, also pine straw, leaves, etc. Can I utilize these profitably?

J. Paul Gilbreath
Lanett, Alabama

Answer

Replying to your letter, the weeds and grasses that you mention would be ideal for making organic fertilizer. The same applies to the mixed pine and hardwood sawdust as well as pine straw and leaves.

Be sure to follow the instructions in the little booklet that we are sending you, which describes how to make a compost heap.

Dear Sirs:

As a subscriber to Organic Gardening, with not much chance to put the knowledge into practice, I would like very much to know if I may be able to purchase some of the products raised on your farm.

Yours truly,
C. W. Stratman
Pittsburgh, Pa.

Answer

Dear Mr. Stratman:

Sorry that only some of the food raised is for sale, and that locally, only. After the war I believe cooperative associations will be formed in various cities to produce food properly. I trust that the Pittsburgh area will be included. We expect to start one in Allentown.

Dear Sir:

What are the natural enemies of poultry lice—poultry mites, dog fleas and nematodes?

Can they all be eliminated by biologic or organic gardening means, without sprays or disinfectants?

The mites and fleas seem to live in hot, dry, sandy soil, where chickens and dogs are kept.

Very sincerely,
Clarence T. Flesche
Pomona, Calif.

Dear Mr. Flesche:

You ask how some of the enemies of poultry may be eliminated by biologic or organic gardening means without sprays or disinfectants. We feel that certain natural precautions in the poultry house should be taken, such as painting the roosts with creosote or some other disinfectant. Lice, fleas, etc. to a great extent are caused by unhygienic conditions. With people it is the same way. Where homes and bodies are not kept clean, you will find bed bugs and lice.

In a way I am glad that you asked this question because in observing the soil here at Rodale Farms at places where we are doing extra work in the organic manner, the soil is becoming rich. Whoever has worked in rich soil full of humus cannot fail to have noticed how fine and rich and clean it feels. It seems that this type of soil has the unusual ability of quickly digesting substances that need digestion.

This was a terribly run down farm when we secured it

several years ago but I can very easily say that with four or five years of proper handling of the soil, it will become rich and it will become "clean". In other words, in my opinion there is such a thing as clean soil and dirty soil. There is a great difference between dirt and soil so that where chickens are kept on soil which is worked in the organic manner, I believe that such things as lice and other harmful organisms will not be able to thrive.

In the May issue I wrote about my experiments with chickens which explains how the soil in my outside pen is becoming soft and rich.

Gentlemen:

I would like to ask a question about the preparation and use of compost.

I understand that the simplest form of compost is made from the use of old vegetation in layers, alternating with manure, etc.; also, that it takes approximately three months to prepare the heap for use; also that it is desirable to use this compost when planting. What disturbs me is the time element. The planting is done, as a rule, before you have the surplus or waste garden products available. How then is it possible three months before that time to make a compost heap in the manner stated? Let us assume we begin to plant our garden about April 1st. Where are we, in January and February, to get the hay, old vegetable plants, etc., etc., to make up the layers of vegetation going into the compost?

The second question arises after we dig up our potatoes, etc., and thus have old vegetation available for the making of compost, what use would we put that compost to at a date three months later?

In short, the time cycle in this matter does not seem to work out correctly.

Very truly yours,
L. Stauffer Oliver
Glen Mills, Pa.

Answer

Dear Mr. Oliver:

Replying to your letter of June 28th, it is best to start planning the season before planting. In other words, the residue materials that you have available starting the first spring, should be composted. Some of this may be available for late vegetable planting such as in July. Some of it could be used in the fall and plowed under. In that case if you can obtain some mulching material to cover the plowed ground over the winter, you would get excellent results. Such mulching material could consist of straw or spoiled hay, weeds, grass clippings, leaves, etc. In the spring this could be plowed under.

It is possible the first season, if you do not have compost, to purchase some humus through the nursery trade. We also recommend bone meal. There are other organic materials on the market which you would have to use for the first period before your own compost is ready.

Regarding the second question, if you dig up your potatoes in August and use the residue material for compost then, this material may be ready about November or December and it depends on the weather at that time of the year as to whether you should apply it and plow under. If not usable at that time, due to the weather, is should be protected over the winter for best results, possibly by the use of a straw mulch or an extra quantity of earth or canvas, etc.

Gentlemen:

I am starting a compost heap and would like your advice as to whether or not it would be better to pick out an open spot where the sun hits it all day

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long or would I have better results in a shady spot?

Very truly yours,
Frederick W. Werner
Brooklyn, N. Y.

Answer

Dear Mr. Werner:

Compost heaps, if possible, should be put in shady spots rather than in open sunlight. It is also advisable to have it protected at least from the north and if possible, from the east and west sides by either hedges, a protective hill-side or some other means.

Dear Mr. Rodale:

My home is situated in a grove of oak trees—white and red. I have been told the leaves are acid and do not make good compost. Is this true? Also, I often shoot a g r a y squirrel. How could these be utilized?

Sincerely yours,
L. G. Pratt
Wellesley Hills, Mass.

P.S. I haven't as yet come to the point where I can eat the squirrels!

Answer

Dear Mr. Pratt:

You are correct. The leaves of oak trees are acid but after breaking down in the compost heap with the use of manure and lime, it will turn neutral. It is best not to use leaves exclusively as the green material in compost heaps. Mix them with other things s u c h as weeds, grass clippings, spoiled hay, etc. Any small animal can be placed in the compost heap and it will decay in about three or four months.

Gentlemen:

If you have any special information on r h u b a r b we would appreciate a copy of such a paper.

Respectfully,
Ralph Reed
Moose Pass, Alaska

Answer

Dear Sir:

Would suggest that this is a more or less risky vegetable and would advise that it be eaten in moderation because it contains more than a s a f e quantity of oxalic acid. This acid is rather strong and is used in laundry preparations for cleaning purposes.

In a small quantity in moderation, there probably would be no harm in eating rhubarb.

Dear Sir:

Enjoy reading Organic Gardening and read every article in each month's issue.

Expect to have a farm next year and I will be able to try the compost method.

Have tried chemical fertilizers in some choice flowers and results were disastrous.

Yours truly,
B. W. Bentley
Buffalo, N. Y.

Your c o m p o s t idea looks good to me. It seems to make sense. Here's an idea I've had a long time. Vacuum cleaners are now in every place in many kinds of work.

Now in the fall when the leaves are falling they are a nuisance. Why not a big suction sweeper powered from a truck. A prairie schooner top on the platform truck and there you are.

It should be popular and a money maker. Features might be patented. Go to it.

H. G. Newell
Rome, Pa.

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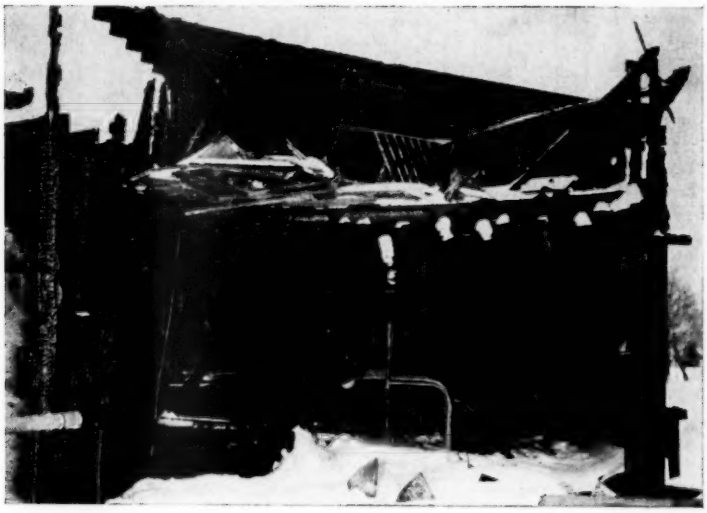

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